



EMI TEST REPORT

Test Report No. : 12311666H-B-R1

Applicant : Sumitomo Wiring Systems, Ltd.
Type of Equipment : BCM(Body Control Module)
Model No. : K52RA
Test regulation : FCC Part 15 Subpart B: 2018
FCC ID : 2AKB8K52RA
Test Result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report covers EMC technical requirements. It does not cover administrative issues such as Manual or non-EMC test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
8. This report is a revised version of 12311666H-B. 12311666H-B is replaced with this report.

Date of test: June 11, 2018

Representative test engineer:

K. Yamamoto

Koji Yamamoto

Engineer

Consumer Technology Division

Approved by:

S. Miyazono

Shinichi Miyazono

Engineer

Consumer Technology Division



NVLAP LAB CODE: 200572-0

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UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

13-EM-F0429

REVISION HISTORY

Original Test Report No.: 12311666H-B

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SECTION 1: Customer information

Company Name	:	Sumitomo Wiring Systems, Ltd.
Address	:	1820 Nakanoike, Mikkaichi-cho, Suzuka-City, Mie Pref. 513-8631 JAPAN
Telephone Number	:	+81-59-340-1137
Facsimile Number	:	+81-59-383-3943
Contact Person	:	Toshiyuki Sonoda

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	:	BCM (Body Control Module)
Model No.	:	K52RA
Serial No.	:	Refer to Clause 4.2
Rating	:	DC 12 V
Receipt Date of Sample	:	May 18, 2018
Country of Mass-production	:	Japan
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model: K52RA (referred to as the EUT in this report) is the BCM (Body Control Module).

Radio Specification

[LF Transmitter]*

Radio Type	:	Transmitter
Frequency of Operation	:	125 kHz
Modulation	:	OOK (ASK)
Method of Frequency Generation	:	Ceramic resonator
Operating temperature range	:	-40 deg. C to +85 deg. C
Clock Frequency (maximum)	:	4.002 MHz

*The test of transmitter part was performed separately from this test report, and the conformability is confirmed.

[RF Receiver]

Radio Type	:	Receiver
Frequency of Operation	:	433.92 MHz
Method of Frequency Generation	:	Crystal
Operating temperature range	:	-40 deg. C to +85 deg. C
Receiver Bandwidth	:	60.06 kHz
Clock Frequency (maximum)	:	21.948717 MHz

SECTION 3: Test specification, procedures & results

3.1 Test specification

Test Specification : FCC Part 15 Subpart B
FCC Part 15 final revised on March 12, 2018 and effective April 11, 2018

Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

3.2 Procedures and results

Item	Test Procedure	Limits	Deviation	Worst margin	Result
Conducted emission	FCC: ANSI C63.4: 2014 7. AC power - line conducted emission measurements	FCC: Part 15 Subpart B 15.107(a)	N/A *1)	N/A	N/A
	IC: RSS-Gen 8.8	IC: RSS-Gen 8.8			
Radiated emission	FCC: ANSI C63.4: 2014 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	18.6 dB, 72.015 MHz Vertical, QP	Complied
	IC: RSS-Gen 7	IC: RSS-Gen 7.1.2			
*Note: UL Japan, Inc’s EMI Work Procedure 13-EM-W0420. *1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.					

3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$.

Polarity	Radiated emission (Below 1 GHz)			
	(3 m*)(+/-)		(10 m*)(+/-)	
	30 MHz to 200 MHz	200 MHz to 1000 MHz	30 MHz to 200 MHz	200 MHz to 1000 MHz
Horizontal	4.8 dB	5.2 dB	4.8 dB	5.0 dB
Vertical	5.0 dB	6.3 dB	4.9 dB	5.0 dB

Radiated emission (Above 1 GHz)				
(3 m*)(+/-)		(1 m*)(+/-)		(10 m*)(+/-)
1 GHz to 6 GHz	6 GHz to 18 GHz	10 GHz to 26.5 GHz	26.5 GHz to 40 GHz	1 GHz to 18 GHz
5.0 dB	5.3 dB	5.8 dB	5.8 dB	5.2 dB

* Measurement distance

Radiated emission test(3 m)

The data listed in this test report has enough margin, more than the site margin.

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124
NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	-	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.6 shielded room	-	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	-	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	-	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	-	3.1 x 5.0 x 2.7	N/A	-	-
No.9 measurement room	-	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.11 measurement room	-	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 m x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of E.U.T. during testing

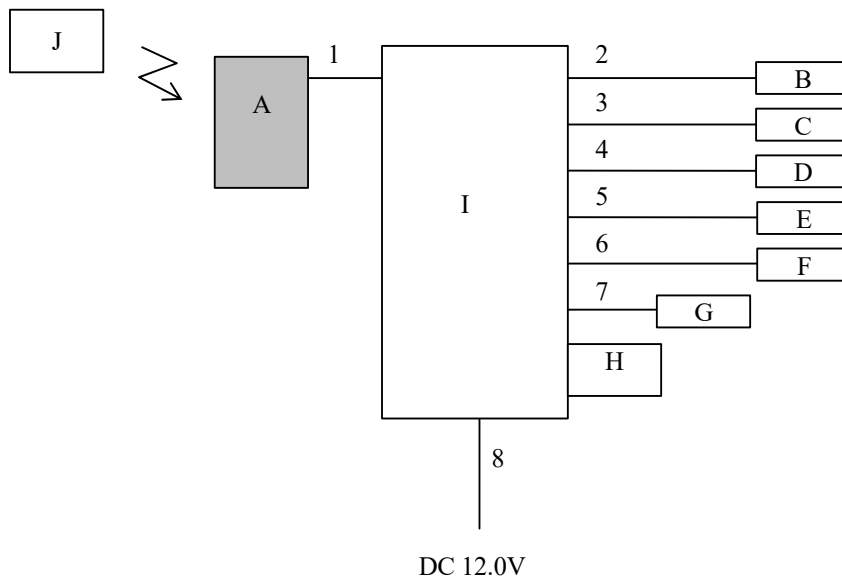
4.1 Operating modes

Mode	Remarks
Receiving mode	-

*The test signal level was confirmed to be sufficient to stabilize the local oscillator of the EUT.

* It was confirmed by using checker that the EUT receives the signal from the transmitter (pair of EUT).

4.2 Configuration and peripherals



* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

*Item No. A includes Receiver Antenna.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	BCM (Body Control Module)	K52RA	001	Sumitomo Wiring Systems, Ltd.	EUT
B	LF Antenna (AND)	LF Antenna B	001	Sumitomo Wiring Systems, Ltd.	-
C	LF Antenna (ANA)	LF Antenna B	002	Sumitomo Wiring Systems, Ltd.	-
D	LF Antenna (ANB)	LF Antenna C	003	Sumitomo Wiring Systems, Ltd.	-
E	LF Antenna (ANI)	LF Antenna C	004	Sumitomo Wiring Systems, Ltd.	-
F	LF Antenna (ANL)	LF Antenna A	005	Sumitomo Wiring Systems, Ltd.	-
G	Steering Lock	-	001	-	-
H	Push SW	-	001	-	-
I	Checker BOX	-	-	-	-
J	FOB	-	KEY-C	-	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal & DC Cable	1.5	Unshielded	Unshielded	-
2	Antenna Cable	2.0	Unshielded	Unshielded	-
3	Antenna Cable	2.0	Unshielded	Unshielded	-
4	Antenna Cable	2.0	Unshielded	Unshielded	-
5	Antenna Cable	2.0	Unshielded	Unshielded	-
6	Antenna Cable	2.0	Unshielded	Unshielded	-
7	Signal Cable	0.3	Unshielded	Unshielded	-
8	DC Cable	1.8	Unshielded	Unshielded	-

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.3 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.

The EUT was set on the edge of the tabletop.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

Photographs of the set up are shown in Appendix 3.

5.3 Test conditions

Frequency range : 30 MHz - 200 MHz (Biconical antenna) / 200 MHz - 1000 MHz (Logperiodic antenna)
1000 MHz - 3000 MHz (Horn antenna)
Test distance : 3 m
EUT position : Table top
EUT operation mode : See Clause 4.1

5.4 Test procedure

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver.

The radiated emission measurements were made with the following detector function of the Test Receiver.

Frequency	Below 1 GHz	Above 1 GHz *1)
Instrument used	Test Receiver	Test Receiver
IF Bandwidth	QP: BW 120 kHz	PK: BW 1 MHz, CISPR AV: BW 1 MHz

*1) The measurement data was adjusted to a 3 m distance using the following Distance Factor.

Distance Factor: $20 \times \log (3.8 \text{ m} / 3 \text{ m}) = 2.05 \text{ dB}$

- The noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

5.5 Test result

Summary of the test results: Pass

Date: June 11, 2018

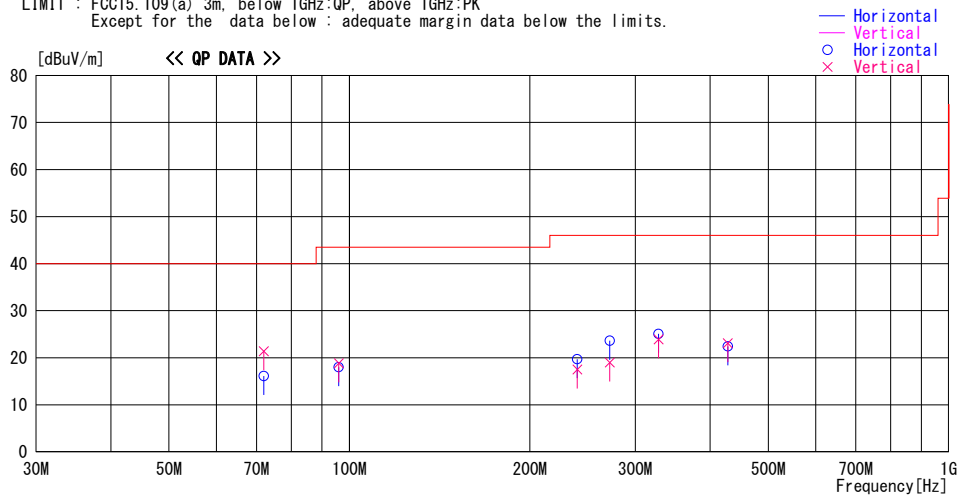
Test engineer: Koji Yamamoto

APPENDIX 1: Test data

Radiated Emission

Test place : Ise EMC Lab.
Semi Anechoic Chamber : No.3
Order No. : 12311666H
Date : June 11, 2018
Temperature / Humidity : 22 deg. C / 50 % RH
Engineer : Koji Yamamoto
(Below 1 GHz)
Mode : Rx 433.92 MHz

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
72.015	34.3	QP	6.2	-24.4	16.1	252	300	Hori.	40.0	23.9	
72.015	39.6	QP	6.2	-24.4	21.4	250	100	Vert.	40.0	18.6	
96.038	32.7	QP	9.4	-24.1	18.0	201	300	Hori.	43.5	25.5	
96.038	33.5	QP	9.4	-24.1	18.8	229	100	Vert.	43.5	24.7	
240.076	30.8	QP	11.5	-22.6	19.7	150	131	Hori.	46.0	26.3	
240.076	28.6	QP	11.5	-22.6	17.5	177	100	Vert.	46.0	28.5	
272.047	33.5	QP	12.4	-22.3	23.6	102	110	Hori.	46.0	22.4	
272.047	28.9	QP	12.4	-22.3	19.0	241	100	Vert.	46.0	27.0	
328.063	33.0	QP	14.0	-21.9	25.1	350	100	Hori.	46.0	20.9	
328.063	31.8	QP	14.0	-21.9	23.9	65	100	Vert.	46.0	22.1	
428.086	27.5	QP	16.1	-21.2	22.4	0	100	Hori.	46.0	23.6	
428.086	28.2	QP	16.1	-21.2	23.1	26	100	Vert.	46.0	22.9	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN

CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE + ATT - GAIN (AMP))

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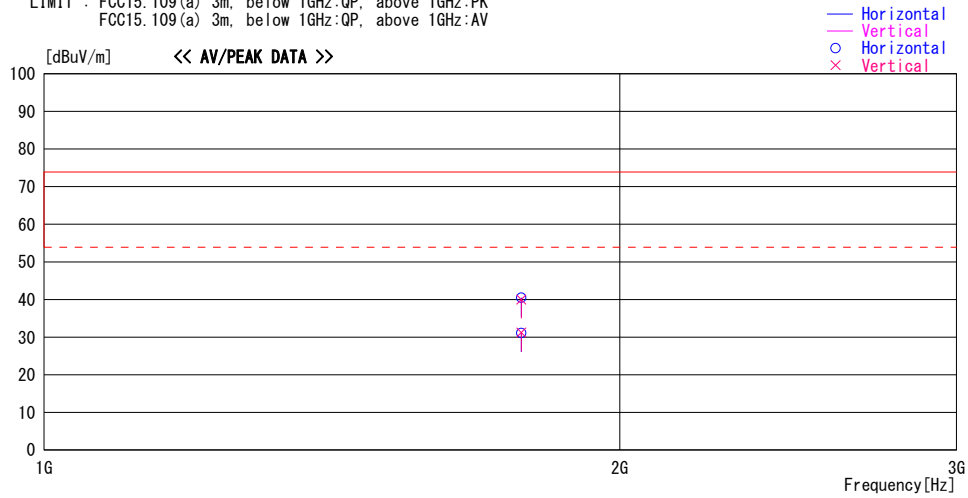
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Emission

Test place : Ise EMC Lab.
Semi Anechoic Chamber : No.3
Order No. : 12311666H
Date : June 11, 2018
Temperature / Humidity : 22 deg. C / 50 % RH
Engineer : Koji Yamamoto
(Above 1 GHz)
Mode : Rx 433.92 MHz

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency	Reading	DET	Antenna		Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Loss& Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1776.258	43.1	PK	26.4	-29.0	40.5	0	100	Hori.	73.9	33.4	
1776.258	42.6	PK	26.4	-29.0	40.0	216	100	Vert.	73.9	33.9	
1776.258	33.7	AV	26.4	-29.0	31.1	0	100	Hori.	53.9	22.8	
1776.258	33.8	AV	26.4	-29.0	31.2	216	100	Vert.	53.9	22.7	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS & GAIN (CABLE - GAIN (AMP) + D-factor)

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

APPENDIX 2: Test instruments

EMI test equipment

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	142183	Measure	KOMELON	KMC-36	-	-	-	-
RE	141554	Thermo-Hygrometer	CUSTOM	CTH-180	1301	1/24/2018	1/31/2019	12
RE	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	10/31/2017	10/31/2018	12
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	6/27/2017	6/30/2018	12
RE	141424	Biconical Antenna	Schwarzbeck	BBA9106	1915	10/2/2017	10/31/2018	12
RE	141580	MicroWave System Amplifier	AGILENT	83017A	MY39500779	3/13/2018	3/31/2019	12
RE	141323	Coaxial cable	UL Japan	-	-	7/12/2017	7/31/2018	12
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	11/5/1900	260834	2/27/2018	2/28/2019	12
RE	141532	DIGITAL HiTESTER	HIOKI	3805	51201197	1/9/2018	1/31/2019	12
RE	141514	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	1611	9/14/2017	9/30/2018	12
RE	148897	Attenuator	KEYSIGHT	8491A	MY52462349	12/18/2017	12/31/2018	12
RE	141417	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	5/7/2018	5/31/2019	12
RE	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-191	1/30/2018	1/31/2019	12

*Hyphens for Last Calibration Date, Calibration Due Date and Cal Int are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test item:

RE: Radiated emission

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Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124